IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Yannick PEYSSON et al

Serial No: Unassigned

Filed: November 6, 2001

For: METHOD OF DETERMINING THE THERMAL
PROFILE OF A DRILLING FLUID IN A WELL

Art Unit: Unassigned

Examiner: Unassigned

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents   November 6, 2001
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified application, please add the following

new claims as follows:

IN THE CLAIMS

Please cancel original claims 1-10 without prejudice or disclaimer and add new

claims 11-20 in this new application.

-- 11. A method of determining a thermal profile of a drilling fluid circulating in a well

during drilling, comprising the steps:

        a)   determining a expression $\theta1$ of a thermal profile of the drilling fluid

            inside the drill string in the well and a expression $\theta2$ of a thermal

            profile of drilling fluid in a surrounding annulus, using a heat

propagation equation accounting for a thermal profile of a medium surrounding the well;

b) measuring a temperature of the drilling fluid at a well inlet T1, a temperature at a bottom of the well T2, and a temperature at a well outlet T3; and wherein

c) the expressions $\theta 1$ and $\theta 2$ meet temperature boundary conditions of T1, T2 and T3.

12. A method as claimed in claim 11 comprising, after step c):

d) providing a drilling fluid having a thermal profile which is a function of the depth.

13. A method as claimed in claim 11 wherein:

repeating steps b), c) and d) to obtain a real-time temperature profile.

14. A method as claimed in claim 11, wherein:

in step a), expressions $\theta 1$ and $\theta 2$ comprise unknown constants, and

in step c), expressions $\theta 1$ and $\theta 2$ are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

15. A method as claimed in claim 11 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a

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balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

16. A method as claimed in claim 11, wherein:

in step a) a heat propagation equation in a homogeneous medium on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

17. A method as claimed in claim 11 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the surrounding annulus are continuous.

18. A method as claimed in claim 11, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of a medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the surrounding annulus are continuous.

19. A use of the method as claimed in claim 11, wherein:

calculation of pressure drops of the drilling fluid circulating in the well during drilling are made.

20. A use of the method as claimed in claim 11, wherein:

calculation of hydrate formation zones in the drilling fluid during drilling are made.--
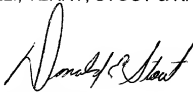
REMARKS

New Claims 11-20 have been added to replace original claims 1-10.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (Case No. 612.40801X00) and please credit any excess fees to such Deposit Account.

Entry of the Preliminary Amendment is respectfully solicited.

Respectfully submitted,

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DES:clt